

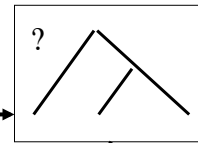
## How do kids learn the rules of grammar?

Where's your  
nose?

Did you brush  
your teeth?

Look at the  
bunny!

etc. ....



Do you  
remember the  
video game you  
told me last night  
on the phone you  
would buy me?

## What gets them from sentences to rules?

- Two possible sources of explanation:

(1) Properties of the learner → **Nativist**

(2) Properties of the environment → **Empiricist**

All theories appeal to both



Nativist



Empiricist

One way the role of the environment has been studied:

- Could special properties of parents' speech make the environment especially informative?
- Question: *How is speech to children different from speech to adults?*

Okay, could these modifications be helpful for learners?

- A: Yes. Words are easier to identify (and learn) if they are spoken more slowly, in shorter sentences, repeated more often, etc.
- B: No. Children get less data from their input, about vocabulary and different types of sentences, from simplified input.

## Studies of the syntax of "motherese"

(1) **Not really simpler in grammar.**

Short sentences, yes.

But not the simplest ones:

- 90% of sentences to adults declarative
  - N V N (e.g., The dog chased the cat.)
- Only 10% of sentences to kids!
- Instead?

Questions: **Who** did the dog chase **☒**?

Imperatives: **☒** Drink your juice.

## Studies of the syntax of "motherese"

(2) **Each mother's speech practices do not predict how quickly her child learns basic syntax. (Newport, Gleitman)**

Longitudinal study of Mother-Child conversation  
(compared to Mother-Adult conversation)

- Time 1: 1- and 2-word speakers
- Time 2: 6 months later

Measures:

- Complexity of both M's and C's speech
- Growth scores for children (Time 2 - Time 1)

## Studies of the syntax of "motherese"

- (2) Each mother's speech practices did not predict how quickly her child learns basic syntax. (Newport, Gleitman)

Results:

- Each mother's speech complexity does not predict her child's growth scores

Language learning is robust

## Studies of the syntax of "motherese"

- (2) Each mother's speech practices do not predict how quickly her child learns basic syntax.

Language learning is robust

- (3) ... With subtle exceptions. E.g., repetitions with changes.

Here's your juice.

Apple juice.

Do you like that?

Do you like the juice?

Drink your juice now.

Drink it up.

*Why would this help?*

## Studies of the syntax of "motherese"

- (2) Each mother's speech practices do not predict how quickly her child learns basic syntax.

Language learning is robust

- (3) ... With subtle exceptions.

E.g., lots of yes/no questions --> child uses auxiliary verbs earlier

Did you finish your peas?

Can you find the bunny?

*Why would this help?*

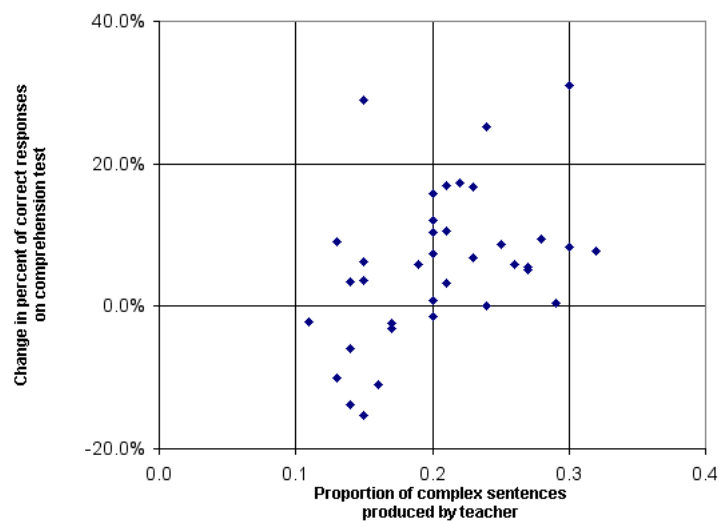
- (4) Clearer effects of each child's environment can be seen on more complex aspects of language

- People vary in their use of complex, embedded sentences.  
e.g., "He gave the book to the girl **who lived down the street.**"
  - Harder to construct
  - Harder to understand

## Evidence: Huttenlocher et al. (2002)

- 4- to 5-year olds
  - Use complex sentences more often if their own mothers do.
  - Or if their preschool teachers do.

... And improve more in comprehension of complex sentences if their teacher uses them a lot.



## Evidence for the biological contribution

- Who learns language?

**ALL HUMANS**

- When?

**IN CHILDHOOD**

*Is this critical?*

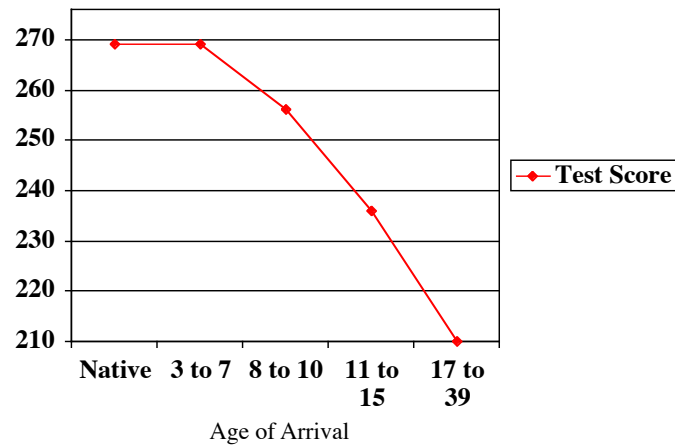
*Critical or sensitive period hypothesis.*

## Evidence from L2 acquisition

Johnson & Newport 1989

- Korean & Chinese speakers
- Various ages of exposure to English (age 3 to 39)
- All adults at test (Varying in age)
- Test:
  - Listen to taped sentences
  - Grammatical or not?

## Results:



## Johnson & Newport: Overall picture of results

- Adult learners (after about puberty)
  - Are much worse
  - and increasing age within this range makes little difference
- Child learners
  - Strong age effects in this range: the older you start, the less you learn
  - Native fluency achieved only by the youngest children (e.g., start before 6 or 7 years)
- Other factors that might affect learning?



## What about first language?

Newport & Suppalla 1990

- Deaf children of hearing parents
  - Oral/manual education debate
  - Variation in age of exposure to a first language
- Subjects: 3 groups
  - Native:** from birth (deaf parents)
  - Early:** at school, early childhood
  - Late:** after 12
- Minimum 30 years daily use of ASL

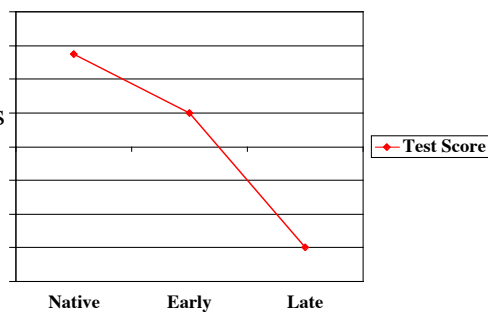
## Results: Sentence Production

- (1) Basic word order: No effect of starting age.

SVO, all groups ~ 100% correct

- (2) But in more complex aspects of grammar: Clear effect of age

How many  
required elements  
are present?





#### Seven Morpheme Categories of ASL Verbs of Motion

Root = Path along which object moves

Orientation = Orientation or direction in which the object moves

Manner = Manner in which the object moves

Location = Locative relationship of moving object to secondary object

Position = Position of the secondary object with respect to the central object path

Central Object Handshape = Class (category or size and shape) of the moving object

Secondary Object Handshape = Class (category or size and shape) of the secondary object

## How do kids learn the rules of grammar?

- The role of the ENVIRONMENT
  - Kids need lots of exposure to learn a particular language
- But also the CHILD
  - Children are better language learners

*Do some aspects of human languages come from children?*

*Invention rather than learning?*

## What happens if children grow up without exposure to a conventional language?

The case of Home Sign

Susan Goldin-Meadow & colleagues (e.g., Science, 1977)

- most deaf children are born to hearing parents
- oral/manual education debate
- frequent linguistic isolation

## What do the children do?

- Spontaneous gestural communication systems (Home Sign)
- Striking similarities to ordinary language development

## The 1st study

- Feldman, Goldin-Meadow & Gleitman (1976)

### Subjects

- 6 profoundly deaf children
- not exposed to ASL
- studied longitudinally

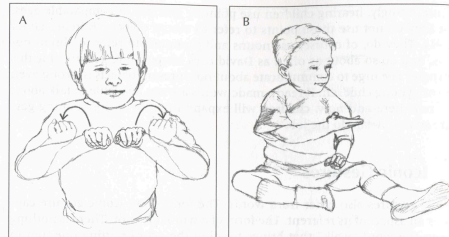
### Methods

- video-taped interactions with parents & experimenter
- coded tapes with rules for identifying & interpreting gestures

## Findings:

- (1) All children gestured. First signs appear at about the right age for first words.
- (2) 2 types of gestures
  - pointing
  - characterizing signs

Both pointing & characterizing signs are  
*abstract signs*

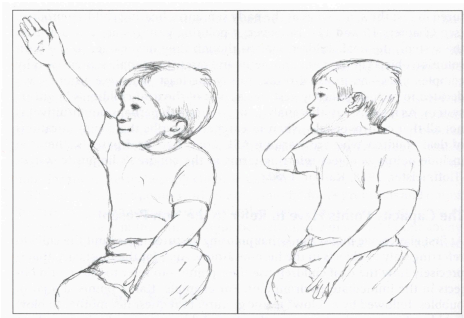


e.g., Signs for 'break' and 'give' not pantomime. The signs don't reflect the specifics of the thing broken or the thing given.

'break' video

<http://www.psypress.com/goldinmeadow/videos/Break.mpg>

Both pointing & characterizing signs are  
*abstract signs*



- Permit reference to absent people!

e.g., Point to Dad's usual chair to gesture "Dad's taking a nap" in another room.

[http://www.psypress.com/goldinmeadow/videos/Dad\\_sleep.mpg](http://www.psypress.com/goldinmeadow/videos/Dad_sleep.mpg)

### (3) Word combinations

- Appear at about the usual age
- Same semantic range as the early sign combinations of children learning a conventional language.
- E.g., "Daddy sleep" video [http://www.psypress.com/goldinmeadow/videos/Dad\\_sleep.mpg](http://www.psypress.com/goldinmeadow/videos/Dad_sleep.mpg)

### (3) Word combinations

- Expand to include sentences with multiple semantic relations
  - like complex sentences in conventional languages!



Swordfish   poke-in-chest   dead   long nose   swim

#### (4) Verb sentence structures

Signs with verb-like meanings occur with predictable sets of nouns spelling out the required event participants:

GIVE → ACT, actor, patient, goal

EAT → ACT, actor, patient

DANCE → ACT, actor

Evidence of several kinds:

e.g., Across multiple short gesture-strings, all relevant elements can be seen. E.g., for 'give':

"cookie-give" "sister-David" "give-David" "duck Susan"

PATIENT-ACT ACTOR-GOAL ACT-GOAL PATIENT-GOAL

#### (4) Verb sentence structures

Signs with verb-like meanings occur with predictable sets of nouns spelling out the required event participants:

GIVE → ACT, actor, patient, goal

EAT → ACT, actor, patient

DANCE → ACT, actor

Nobody has to teach children ...

- To analyze their experience into relationships (verbs) and participants (nouns)
- To include in sentences the nouns needed to specify each participant role for a particular relationship

### (5) Word order conveys meaning

- Most (not all) home signers adopt a consistent word order:
  - e.g., Patient Act
    - CHEESE EAT
  - e.g., Actor Act
    - BOY JUMP

Nobody has to teach children ...

- To detect the abstract similarity in the *agents* or *patients* of very different actions
- And to use gesture order to signal these abstract roles!!

### Could linguistic properties of Home Sign come from parents?

- Everybody gestures, including parents.
- Children clearly learn conventions like headshake for "no"
  - So ... are parents doing it all?

No!

- Children invented new characterizing signs for new toys
- Sign combo's rarer & later in M's gestures than Child's
- M's didn't show same order pattern as C
- Complex (multi-verb) sentences rarer & later in M's gestures than C's



## Conclusions

- Some properties of language emerge in children's invented gesture systems
  - symbolic gestures (words)
  - gesture combinations (sentences)
  - appropriate verb sentence-structures
    - e.g., 'dance' has one participant role, 'eat' has two
  - the use of word order to convey abstract semantic role information
- Children invent key aspects of grammar!

## What does it take to develop a complete language?

### Nicaraguan Sign Language

- 1st schools for the deaf, ~1980
- Children arrive w/ separate Home Signs
- Successive generations of children at school converge on shared NSL
- The children invented it in trying to communicate.



## So how might children learn the rules of grammar?

- **Effects of Language Experience:**  
Children can't learn linguistic structures they don't often encounter in the input
- **Age Effects:**  
Learning flexibility of young children helps.
- **Home Sign:**  
Children invent key aspects of grammar.